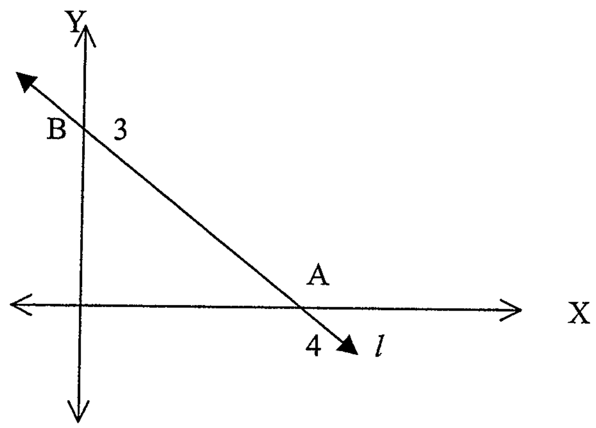
Year Eleven Co ordinate Geometry Test June 2003

- Use separate paper
- Show all necessary working
- Diagrams are not to scale

Name _ _ _ _ ____

Question One (12 marks)

The line l is shown on the diagram below. It crosses the x axis at A ($x = 4$) and the y axis at B ($y = 3$). The line q has equation $y = \frac{4x}{3}$, and is not shown on the diagram. Copy or trace the diagram.



a) Find the gradient of the line l
b) Find the equation of the line l
c) Show that the line l is perpendicular to line q
d) Calculate to the nearest degree the angle the line q makes with the positive X axis.
e) Calculate the length of interval AB
f) Show that the point M (-6 , -8) lies on line q
g) Calculate the perpendicular distance of the point M from line l
h) On your graph shade the region represented by the intersection of $y < 3$ and $x > 4$

Question Two (4 marks)

Find the equation of the line passing through the intersection of the lines $3x - y = 5$ and $x + 2y = 10$ and also passing through the point (-1, 1)

Question Three (4 marks)

Find the co ordinates of P(x, y) which divides the interval joining A(0, -2) to B(3, 5)

a) internally in the ratio 3 : 2
b) externally in the ratio 3 : 2

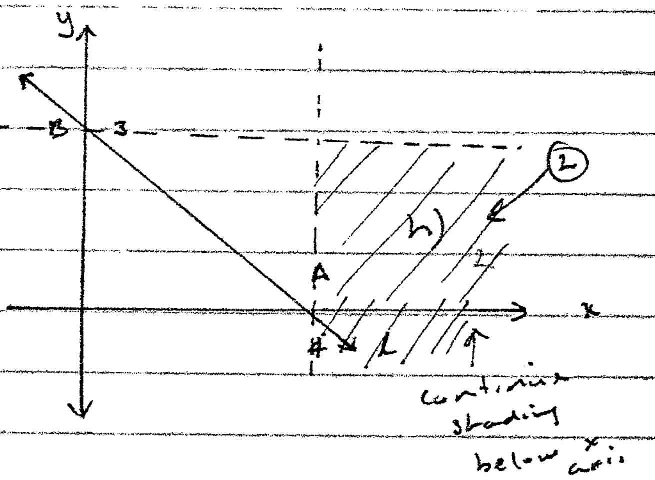
PTO Question 4

Question Four (5 marks)
Given the quadrilateral PQRS where P, Q, R, and S have the co ordinates $\left(\frac{-3}{2},2\right)$, $(-6,-1)$, $\left(\frac{-7}{2},4\right)$, $(1,7)$ respectively;

a) Prove PQRS is a parallelogram
b) Find the area of PQRS

Yr Co-ord Geometry Test Soln's 2003

Question One



a) $m_l = \frac{-3}{4}$ ①

b) $y = \frac{-3}{4}x + 3$

$4y = -3x - 12$

$3x + 4y - 12 = 0$ ①

c) $m_q = \frac{4}{3}$

$m_l \times m_q = -\frac{3}{4} \times \frac{4}{3}$

$= -1$ ①

$\therefore l \perp p$

d) $\tan\theta = \frac{4}{3}$

$\theta = 53°$ ①

e) $AB = \sqrt{3^2 + 4^2}$

$= 5$ ②

f) subst $x = -6$, $y = -8$ in $y = \frac{4x}{3}$

ie $-8 = \frac{4 \times (-6)}{3}$

$= -8$ (LHS = RHS) $\therefore$ pt lies on line ②

g) $d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2+b^2}}$ $a = 3, b = 4, c = -12$

$x_1 = -6, \ y_1 = -8$

$= \frac{|(3)(-6) + (4)(-8) - 12|}{\sqrt{3^2 + 4^2}}$

$= \frac{|-18 + -32 - 12|}{5}$

$= \frac{62}{5}$ ②

/12

Question Two

eqn of form $(3x - y - 5) + k(x + 2y - 10) = 0$ ①

subst $x = -1, y = 1$ $\therefore (-3 - 1 - 5) + k(-1 + 2 - 10) = 0$

$-9 - 9k = 0$ $\therefore k = -1$ ①

ie $3x - y - 5 - x - 2y + 10 = 0$ ①

$2x - 3y + 5 = 0$ ①

/4

Question 3.

$$x = \frac{k_1 x_2 + k_2 x_1}{k_1 + k_2}, \quad y = \frac{k_1 y_2 + k_2 y_1}{k_1 + k_2}$$

$A(0, -2)$, $B(3, 5)$

a) $k_1 : k_2 = 3 : 2$

$$x = \frac{3(3) + 2(0)}{3+2} \qquad y = \frac{3(5) + 2(-2)}{3+2}$$

$$= \frac{9}{5} \quad ① \qquad = \frac{11}{5} \quad ① \quad \text{ie } \left(\frac{9}{5}, \frac{11}{5}\right)$$

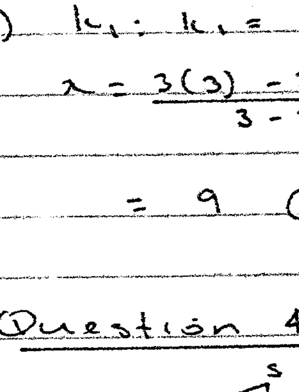
b) $k_1 : k_2 = 3 : -2$ or $-3 : 2$

$$x = \frac{3(3) - 2(0)}{3-2} \qquad y = \frac{3(5) - 2(-2)}{3-2}$$

$$= 9 \quad ① \qquad = 19 \quad ① \qquad \text{ie } (9, 19)$$

Note $2 \times 0 \neq -1$

Question 4



$P(-\frac{3}{2}, 2)$, $Q(-6, -1)$, $R(-\frac{7}{2}, 4)$, $S(1, 7)$

$$m_{PQ} = \frac{-1-2}{-6+\frac{3}{2}} \qquad m_{RS} = \frac{4-7}{-\frac{7}{2}-1} \quad ①$$

$$= \frac{2}{3} \qquad = \frac{2}{3} \qquad \therefore PQ \parallel RS$$

$$m_{QR} = \frac{-1-4}{-6+\frac{7}{2}} \qquad m_{PS} = \frac{7-2}{1+\frac{3}{2}} \quad ①$$

$$= 2 \qquad = 2 \qquad \therefore QR \parallel PS$$

$\therefore$ PQRS a parallelogram (opp sides parallel)

Area = Base × Height

Let Base be QP $\quad (QP) = \sqrt{\left(-\frac{3}{2} - -6\right)^2 + (2 - -1)^2}$

$$= \sqrt{\frac{81}{4} + 9}$$

$$= \sqrt{\frac{117}{4}}$$

$$= \frac{\sqrt{117}}{2}$$

Eqn of QP

$$m = \frac{2 - -1}{-\frac{3}{2} - -6}$$

$$= \frac{3}{\frac{9}{2}}$$

$$= \frac{2}{3}$$

$$(y - -1) = \frac{2}{3}(x - -6)$$

$$y + 1 = \frac{2}{3}(x + 6)$$

$$3y + 3 = 2x + 12$$

$$2x - 3y + 9 = 0$$

Note in a parallelogram the diagonals do not bisect at right angles so you cannot use $A = \frac{1}{2}xy$. Using this formula you get $\sqrt{226}$ which is close to the correct ans (15) because the diagonals are close to being perpendicular. This formula makes the

$\frac{3}{3}$

$$h = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2+b^2}} \qquad a=2,\ b=-3,\ c=9,\ x_1 = \frac{-7}{2}$$
$$y_1 = 4$$

$$= \frac{\left|2\left(\frac{-7}{2}\right) + (-3)(4) + 9\right|}{\sqrt{4+9}}$$

$$= \frac{10}{\sqrt{13}}$$

Stats (total 25)
class $\bar{x}$ = 23-6
best mark 25

$$\therefore \text{Area} = \frac{\sqrt{117}}{2} \times \frac{10}{\sqrt{13}}$$
$$= 5\sqrt{117}$$
$$= 5\sqrt{9}$$
$$= 15 \text{ units}^2 \qquad 3$$